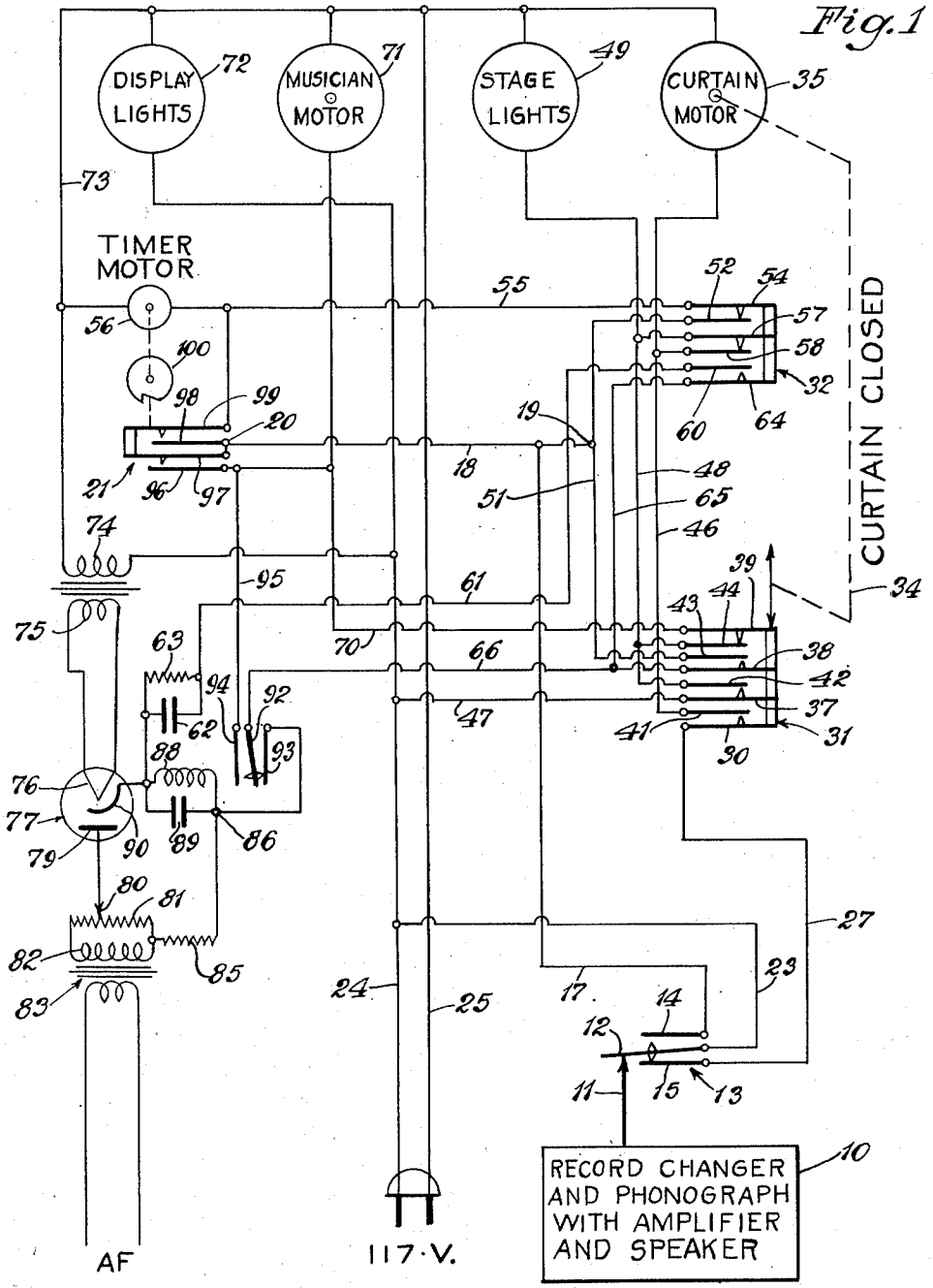
June 26, 1951 J. C. KOCI 2,558,490

ELECTRICAL CONTROL SYSTEM FOR ORCHESTRAL DISPLAY

Filed Aug. 30, 1949 2 Sheets-Sheet 1

Fig. 1



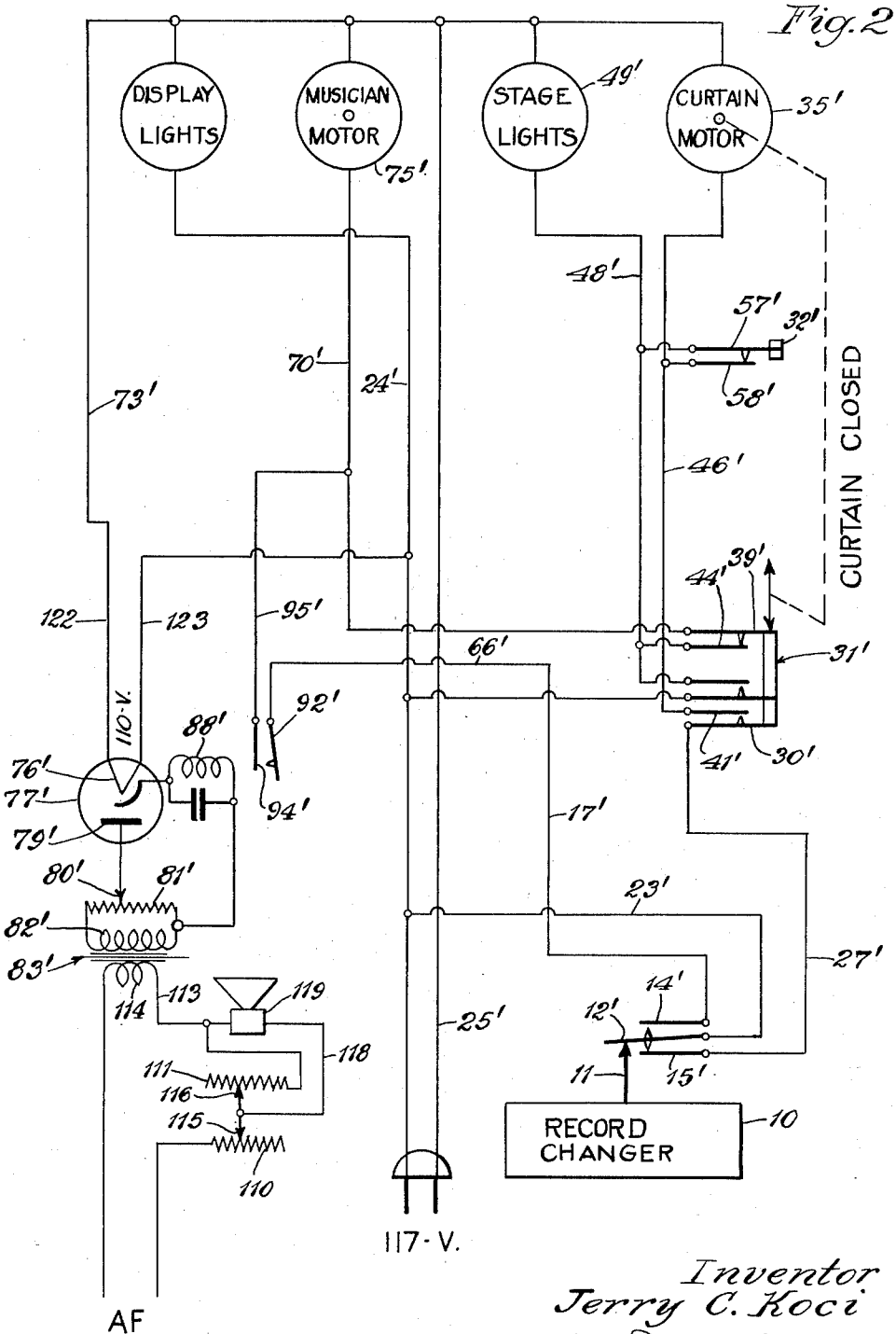
Inventor
Jerry C. Koci
by Robert S. Kahn
Attorney.

June 26, 1951 J. C. KOCI 2,558,490

ELECTRICAL CONTROL SYSTEM FOR ORCHESTRAL DISPLAY

Filed Aug. 30, 1949 2 Sheets-Sheet 2

Fig. 2



Inventor
Jerry C. Koci
by Robert L Kahn
Attorney.

Patented June 26, 1951 2,558,490

UNITED STATES PATENT OFFICE

2,558,490

ELECTRICAL CONTROL SYSTEM FOR ORCHESTRAL DISPLAY

Jerry C. Koci, Barrington, Ill., assignor to Chicago Coin Machine Co., Chicago, Ill., a corporation of Illinois

Application August 30, 1949, Serial No. 113,185

4 Claims. (Cl. 46—118)

1

This invention relates to an electrical apparatus and particularly to a mechanical orchestra attachment for use with a sound reproducing system. The invention disclosed herein is an improvement upon the matter disclosed and claimed in Peyton 2,254,089 issued August 25, 1941. In this patent there is disclosed a mechanical orchestra having one or more musicians adapted to be mechanically actuated in simulation of real musicians during sound reproduction from an electric phonograph or the like. In the system hereinafter described, suitable switching means are provided for controlling the energization of musicians and activation of curtain mechanism as well as stage lights in connection with sound reproduction from an electric phonograph.

The invention generally provides for sound reproduction voice current control over the mechanical orchestra. Normally, the mechanical orchestra is motionless and unseen when no record is being reproduced. However, upon initiation of a record playing cycle, the orchestra is animated and exhibited. Thereafter during the playing cycle, the orchestra remains animated and visible as long as voice currents are present.

In one form of the invention, voice currents exercise a direct supervisory control over the animation and exhibition of the orchestra. In another form of the invention a timer system initially takes over the supervisory control for a minimum playing time and releases control to the voice current means after the expiration of some minimum playing time.

The details of the mechanical orchestra as far as operating means for individual players are not described here and may be found in the above mentioned Peyton patent.

In order that the invention may be explained, reference will now be made to the drawings wherein Figure 1 is a diagrammatic showing of a system embodying one form of the invention while Figure 2 is a diagrammatic showing of a modified form of the invention.

The system forming the subject matter of the present invention is adapted to operate with record changer 10 of any type. Changer 10 has plunger 11 which is normally in a down position but is elevated during the time that a record is on a turntable. Plunger 11 cooperates with movable contact 12 of switch 13. This switch has fixed contacts 14 and 15 with which movable contact 12 cooperates. Contact 14 is connected by wire 17 going to wire 18 extending between junction 19 and terminal 20 of locking switch 21.

2

Changer operated contact 12 is connected by wire 23 to line 24 of a power circuit. The power circuit includes line 25. Changer switch contact 15 is connected by wire 27 to a terminal of contact 30 of switch block 31. Switch block 31 is one of two switch blocks 31 and 32 which are mechanically inter-connected to curtain 34 operated by motor 35. Switch block 31 is in the position shown when the curtain is closed and is adapted to be moved to its other position when the curtain is away from a fully closed position. Similarly switch block 32 is in the position shown when the curtain is away from a fully opened position and moved to its other position when the curtain is fully open. The means for operating the switch blocks may assume a variety of forms. Thus motor 35 will generally have a range of forward and reverse motion for operating the curtain and an arm or other means may be provided for moving between the extreme curtain positions. An example of a diagrammatic mechanism for accomplishing this is disclosed in my copending application Serial No. 92,591, filed May 11, 1949.

Referring now to switch block 31, this has movable leaves 36, 37, 38, 39 connected together by an insulating block to move as a unit. These contact leaves cooperate respectively with fixed contact leaves 41 to 44 inclusive. It will be noted that contact pair 39 and 44 is closed in the curtain closed position while the remaining contact leaves are open.

Contact leaf 41 is connected by wire 46 to curtain motor 35. Contact leaf 37 is connected by wire 47 to line wire 24 while contact leaf 42 is connected by wire 48 to stage lights 49. Contact leaf 43 is connected by wire 51 to junction 19 and also to contact leaf 52 of switch 32. Contact leaf 44 is connected to wire 48.

Switch block 32 has contact leaf 54 connected by wire 55 to one terminal of timer motor 56. Contact leaf 57 is connected to wire 48 while leaf 58 with which it cooperates is connected to wire 46. Contact leaf 60 is connected to wire 61 and to condenser 62 and shunt resistor 63. Contact leaf 64 is connected by wire 65 to wire 66 going to contact 38. It will be noted that leaves 54 and 52 form one normally closed switch while leaves 57 and 58 form another normally closed switch. Leaves 60 and 64 form a normally open switch.

Contact leaf 39 is connected by wire 70 to musician's motor 71 for actuating the automatons while line wire 24 is connected to display lights 72. Motors 35, 71 and 56 and lights 49 and 72 are connected to common wire 73 going to one

terminal of filament winding 74, the other terminal of which is connected to line 24. Winding 74 cooperates with transformer secondary 75 for energizing heater 76 of rectifier 77.

Rectifier 77 has anode 79 connected by tap 80 to potentiometer resistor 81 connected across secondary 82 of audio-frequency transformer 83. Resistor 81 has one terminal connected through resistor 85 to point 86. Point 86 forms one terminal of a relay having winding 88 shunted by condenser 89. Relay winding 88 is connected to cathode 90 of rectifier 77. Cathode 90 is also connected to condenser 62 and resistor 63.

Relay winding 88 cooperates with movable relay contact 92 normally resting against contact 93 connected to the winding and movable to off-normal contact 94. Movable contact 92 is connected to wire 66 while off-normal contact 94 is connected by wire 95 to switch contact 96 and wire 70. Contact 96 cooperates with movable contact 97 connected to fixed contact 98 and junction 20. Movable contact 99 connected to wire 55 cooperates with fixed contact 98. Movable contacts 99 and 97 are tied together and operated by cam 100 driven by timer motor 56. Motor 56 is preferably a clock motor with suitable gearing so that cam 100 turns at a slow speed, about one turn in two minutes.

The operation of the system will now be explained. When changer 10 operates to select a record, rod 11 will be elevated and remain in elevated position during the time that the selected record is playing. When rod 11 is elevated, movable contact 12 moves to fixed contact 14. This circuit may be traced from line wire 24 to wire 23, movable contact 12, fixed contact 14, wire 17 to wire 18 and wire 51 to contact 52. In the normal position of the system, the curtains are closed and switch block 32 is in the position shown with contact 52 touching movable contact 54. The circuit therefore continues from contact 54 along wire 55 to motor 56 along wire 73 to line wire 25. Thus timer motor 56 will become energized and turn cam 100 in a clockwise direction. After cam 100 has turned a few degrees, switch block 21 will be closed. This will result in switch leaves 52 and 54 being by-passed as far as the timer motor is concerned and the circuit continuing from wire 17 to wire 18 and junction 20 to contact leaf 98 and movable contact 99 then to timer motor 56 and along wire 73 to line wire 25.

After timer motor 56 has started and closed the cam contacts, the timer motor will continue to operate independently of switch block 32. The closure of the contacts by cam 100 will also result in a circuit being established from wire 17 through wire 18 to movable contact 97 and fixed contact 96 to wire 70 and contact leaf 39 of switch block 31. The circuit continues from contact leaf 39 to fixed contact 44 to wire 48 through stage lights 49 and line wire 25. Thus stage lights 49 will be lit. A circuit will also be established from wire 48 to movable contact 57 of switch block 32, fixed contact 58 to curtain motor 25. Thus curtain motor 35 will start to operate. As disclosed more fully in the copending application of Jerry C. Koci, Serial No. 92,591, filed May 11, 1949, after curtain motor 35 has begun to operate to move the curtain from the closed position, switch block 31 has its position changed after the curtain has started to open but before it has reached a fully opened position and switch block 32 is changed after the curtain has reached a fully opened position. Upon reverse movement to close the curtain, switch block 32 will be changed first to be followed by switch block 31. Hence curtain motor 35 will be energized until the curtain is in a fully opened position. When the curtain has finally reached its opened position and switch block 32 has been changed, contacts 57 and 58 open to cut curtain motor 35 off.

When curtain motor 35 has moved the curtain to a fully opened position, switch block 31 has also been changed from the position shown. Thus, the circuit for stage lights 49 will remain closed by virtue of the closure of contacts 37 and 42, this circuit being traced from line 24 to wire 47, contact 37, contact 42 to wire 48 and stage lights 49 back to line wire 25.

Continuing with the operation of the system, closure of cam operated contacts 96 and 97 will also establish a circuit for musician's motor 71. Thus beginning with wire 17, the circuit continues to wire 18, junction point 20, contacts 97 and 96, wire 70, musician's motor 71 and line wire 25. Assuming that sound reproduction is occurring from the record, audio-frequency energy taken from a suitable point on the amplifier is fed to transformer 83. Secondary winding 82 develops an alternating potential across the terminals of resistor 81. Tap 80 feeds alternating energy to rectifier 77 so that a pulsating direct current through relay winding 88 is provided. Condenser 89 prevents the relay from chattering. When relay winding 88 is energized, relay contact 92 is pulled up against contact 94. This effectively places a short across contacts 97 and 96 of the cam operated switch. This may be traced as follows: contact 96 to wire 95, contact 94, contact 92, wire 66, contact 38, contact 43, wire 51 to junction 19 and then wire 18 to contact 97. Thus after cam 100 has made a complete turn, motor 56 shuts itself off with the cam driven contacts being opened. The time of revolution of cam 100 is set to be less than the shortest record which is to be played, this time being of the order of about two minutes. It will be remembered that switch contacts 52 and 54 are open with the curtain open so that when timer motor 56 has turned cam 100 almost a complete revolution, the cam-operated switch contacts will open and open the circuit for the timer motor. Thus when relay winding 88 is energized, the entire power circuit for operating the musician's motor may be traced as follows: from line wire 24 to wire 23, movable changer contact 12, fixed contact 14, wire 17 to junction 19, wire 51 to switch leaf 43, switch leaf 38, wire 66 to relay contact 92, relay contact 94 along wire 95 to wire 70 and then to motor 71 and back to line wire 25.

Continuing the operation of the system, let it be assumed that the record is finished and the changer is operating. In order to prevent momentary operation of relay 88, resistor 63 and condenser 62 are provided, this combination preferably having a time constant of the order of about ten seconds.

Assuming now that the record reproduction is through and no more audio-frequency currents are being fed to transformer 83, relay winding 88 releases the relay so that movable contact 92 drops back to the position shown against normal contact 93. Thus the shunt around cam-operated contacts 96 and 97 is broken. In order to prevent false relay operation from noise currents when no record reproduction occurs, condenser 62 is connected across relay winding 88. This circuit may be traced as follows: condenser 62 to wire 61, contacts 60 and 64 (the curtain is still open and the record changer is beginning to op-

erate), wire 65, wire 66, contacts 92 and 93 to relay winding 88 and thence to condenser 62. Condenser 62 has a large capacitance, such as about 100 m.m.f. so that transients are effectively by-passed across relay winding 88.

When changer 10 has removed a record, contact 12 drops against 15 and closes a circuit for the curtain motor as follows: line 24, wire 23, contacts 12 and 15, wire 27, contacts 30 and 41, wire 46, motor 35 and line 25. When the curtain has closed, switch block 31 is changed to cut motor 35 out.

Timer motor 56 and cam operated contacts 98 and 99 are provided for the purpose of determining a minimum time before a curtain closing part of the cycle may be initiated. The timer motor and its associated parts may be omitted if desired and reliance had upon the presence of audio-frequency currents due to phonograph reproduction for maintaining the automatons in animated condition. Thus referring to Figure 2, a modified system is shown wherein corresponding portions of the circuit bear similar primed numbers.

Audio-frequency transformer 83' is preferably disposed in the speaker circuit. Thus resistors 110 and 111 are connected into line 113 going to primary 114 of transformer 83'. Cooperating with resistors 110 and 111 are wipers 115 and 116 coupled together to function as a unit. It will be noted that resistors 110 and 111 are in reversed relation and together with the wipers provide a so-called L pad type of volume control. Wire 118 is connected to wipers 115 and 116 and goes to speaker 119. The other terminal of speaker 119 is connected to resistor 111. By virtue of this arrangement a substantially constant impedance in series with primary 114 is provided and thus a substantially constant level of audio-frequency energy will be present in primary 114.

Transformer secondary 82' has resistor 81' connected across the same with wiper 80' connected to anode 79' of diode rectifier 77'. The remaining diode connections are generally the same as in Figure 1. However, in Figure 2, heater 76' of the rectifier is adapted to be supplied by 110 volt current obtained by wires 122 connected to wire 73' and 123 connected to line wire 24'. It will be noted that the circuits connected to the diode rectifier have been eliminated and simplified with the relay now being a simple relay with the normal contact dead.

Referring to switch block 32', it will be noted that leaves 57' and 58' are the only ones remaining, these being connected respectively to 48' and 46' going to the stage lights and curtain motor. Similarly switch block 31' has been simplified by the omission of contact leaves 43 and 38 in Figure 1 together with their associated wiring. It will be noted that wire 17' of contact 14' is joined to wire 66' going to relay contact 92'.

The operation of the system shown in Figure 2 will now be explained. Assuming that a record changer cycle has been initiated and that a record is being played, push rod 11 will be elevated so that movable contact 12' will close against fixed contact 14'. A circuit will be established from line wire 24' to wire 23', contacts 12' and 14', wire 17', wire 66' to relay contact 92'. Upon the presence of audio-frequency energy in primary 114, this being connected to the phonograph reproducer amplifier, it will be apparent that relay 88' will be energized to draw relay contact 92' against fixed contact 94'. Hence the circuit from relay contact 92' will continue after the music has started to fixed contact 94' wire 95' to wire 70'

to switch leaves 39' and 44' of switch block 31' then to wire 48' through stage lights 49' to line wire 25'. At the same time another circuit will be established from wire 48' through closed contact leaves 57' and 58' of switch block 32' to wire 46' then through curtain motor 35' to line wire 25'. Thus curtain motor 35' will have its circuit closed and start to operate.

When curtain motor 35' has fully opened the curtains, contacts 57' and 58' will be opened thus stopping motor 35'. At the same time, another circuit from wire 70' through musician's motor 75' to line wire 25' will be established and energize the musicians. By virtue of the L pad volume arrangement, an adequate level of audio-frequency energy will be maintained to insure that the relay will remain closed during phonograph reproduction under all conditions or positions of the volume control. When phonograph reproduction ceases, relay 88' will be opened to cut off the power to musician's motor 75' and to stage lights 49'. At the same time, changer 10 will operate causing rod 11 to drop and complete a circuit between fixed contact 15' and movable contact 12'. This will establish a power circuit for curtain motor 35' as follows: line wire 24', wire 23', contacts 12' and 15', wire 27', contacts 30' and 41', wire 46', curtain motor 35' and line wire 25'. When the curtain has reached a closed position, contacts 30' and 41' will open and the system will revert to the condition in Figure 2.

It is understood that the system shown in each figure includes a complete phonograph with reproducer, amplifier and speaker. The L pad volume control shown in Figure 2 is preferably included in the system of Figure 1.

What is claimed is:

1. In a system of the character described, a mechanical orchestra, a curtain for said orchestra, an electric motor for animating said mechanical orchestra and electric motor mean for moving said curtain for controlling the display of the orchestra, an electric phonograph, means controlled by the initiation of a record playing cycle in said electric phonograph for energizing the animating motor and for energizing the curtain motor so as to exhibit the animated orchestra, means for deenergizing said curtain motor after said curtain has reached an orchestra displaying position, a voice current responsive relay system, connections between said relay system and the electric phonograph, means controlled by said voice current responsive relay system for deenergizing the orchestra animating motor and for energizing the curtain moving motor to terminate the display upon the cessation of voice currents, and means for deenergizing said curtain display motor after said curtain has reached an orchestra concealing position.

2. In a system of the character described, a mechanical orchestra, a curtain for said orchestra, an electric motor for animating said mechanical orchestra, a motor for opening or closing said curtain for displaying or hiding said orchestra, an electric phonograph, means responsive to the initiation of a record playing cycle in said electric phonograph for energizing the orchestra animating motor and for energizing the curtain motor to open the curtain and display the orchestra, means for deenergizing said curtain moving motor after said curtain has reached an orchestra displaying position, a voice current responsive relay system, connections between said relay system and said electric phonograph so that said system is supplied with voice currents from the

electric phonograph and connections between said relay system and said two motors, said relay system connections to said motors providing for a closed circuit for the orchestra motor and an open circuit for the curtain moving motor in the voice current energized position of the relay system and providing for an open circuit for the orchestra motor and a closed circuit for the curtain moving motor in the voice current deenergized position of the relay system, and switch means for opening the circuit of the curtain moving motor after said curtain has been moved to an orchestra-concealing position upon the cessation of voice currents.

3. In a system of the character described, a mechanical orchestra, a curtain for said orchestra, an electric motor for animating said mechanical orchestra, an electric motor for opening or closing said curtain in connection with displaying the orchestra, an electric phonograph, means responsive to the initiation of a record playing cycle in said electric phonograph for energizing said orchestra animating motor and for energizing the curtain motor to open the curtain and display the orchestra, means for deenergizing said curtain moving motor after said curtain has reached an orchestra displaying position, a voice current responsive relay system, connections between said electric phonograph and said relay system so that said system is supplied by voice currents from the electric phonograph, connections between said relay system and said two motors, said relay system connections to said motors

in voice current energizing position providing for a closed circuit for the orchestra motor and an open circuit for the curtain moving motor and in the voice current deenergized position providing for an open circuit for the orchestra motor and a closed circuit for the curtain moving motor, timing means including switch contacts, connections between said timing switch contacts and said relay system so that when said timing system is operative said relay system is maintained in a voice current responsive condition and means for rendering said timing means operative at the beginning of a record playing cycle and for a predetermined minimum time and means for opening the circuit of the curtain moving motor when said curtain has reached a closed position in a curtain closing operation.

4. The system according to claim 3 wherein said timing means comprises a timing motor and contacts driven by said motor and connections for shorting out the voice current relay during the timing cycle.

JERRY C. KOCI.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,254,089	Peyton	Aug. 26, 1941
2,307,296	Peyton	Jan. 5, 1943